AGC/WSDOT Structures Team Minutes
30 November 2007

Members

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1 Team co-chair

Guests

Attendee:	Company	Phone	E-mail
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Topics - Mountlake Terrace Constructibility, Pile Driving Analyzer (PDA).

The meeting started at 09:00.

1. Constructibility Review – Mountlake Terrace

WSDOT and ST Design staff presented the design for the Mountlake Terrace Freeway Station project. Prior to the meeting, designers provided the team a summary of geotechnical conditions, structural plans, and a list of questions. Significant structures include a pedestrian bridge, the station building, and associated walls. The project is scheduled for Ad June 9, 2008 with 436 working days across 2 construction seasons.

The pedestrian bridge includes the following characteristics:

- W74G prestressed girders.
- Four spans – 14'-4 1/2", 91'-6", 91'-6", and 140'-32 7/8" (crosses I-5 N).
- Tubular steel frame roof.

The station building and walls include the following:

- Two elevator towers, stairs, elevated connecting walkway, transit loading platforms, and storage towers.
- Station length of 220'; tower heights of 27' to 56' above I-5.
- Transparent acrylic noise barrier sheeting along station sides.
- Tubular steel frame roof.
- Reinforced concrete cantilever retaining walls and one gabion wall.
- Spread footing and drilled shaft foundations.
- Several locations with attachment to existing adjacent structures.

Project constraints are identified as follows:

- Width - Median width is 76ft; station width is limited to 56'.
- Height - Station height is limited by vertical clearance of existing overcrossing structures at 236th St SW and 228th St SW.
- Location - Station is south within project site to allow shorter pedestrian bridge.
- Drainage – Significant drainage currently flows into site; flow splitter will be relocated.
- 12" diameter sanitary sewer crossing I-5 at north end of station.
- All glazing material must be Paraglas Soundstop GS CC Noise Barrier Sheet.
- At grade crossing between platforms is prohibited.

Designers posed the following questions to the team:

- Would the prime be a building or a road contractor?
- What is the greatest cost risk?
- How does counting all days working days, regardless of weather, impact cost?
- Would a winter shutdown impact costs up or down?
- What is the variation in cost for building structural steel versus reinforcement bars? Estimates used $2.50-$4.00 for structural members and $1.25-$1.50 for rebar.
- Will the 2-season nature affect HMA bids due to market volatility?
- How can the risk (cost) be reduced on architectural work?
- How should traffic control be written in contract to allow day or night work?

- How does the adjacent construction for Mountlake Terrace Park and Ride Expansion by Berschauer Phillips impact the cost?
- Is 463 working days reasonable and include adequate lead time?
- Any comments on construction sequence and work zone access?

Discussion included the following:

- Glass windows are held in place by retaining cables.
- Surface runoff flowing into the median is from approx 100 acres offsite.
- Cannot use adjacent parking area due to ongoing construction.
- The 56' median access is small
- Access into the median during work is a great concern.
- Ad in June, award in July forces earthwork into winter and is not recommended; change to Apr/Mar bid opening.
- Better pricing with Apr/Mar bid opening because crews are not yet overcommitted with work.
- Take drilled shafts to ADSC to discuss cases where they are 10 ft from footing of adjacent parking garage.
- Non-workable days has smaller effect on larger jobs; this policy greatly affects small parts of the project, cold-weather protection, and erosion control.
- Paraglas will prefab the full system at cost premium using their engineers or they will provide unassembled components; this is contractor choice.
- It is not clear if structural shoring is required for footing and drainage work adjacent to the roadway, recommend clarifying in the contract.
- Drainage is the first item of work; TSE build flowsplitter in median; temp pipe 300 ft from north will bypass median.
- Clarify is trench boxes are allowed for installation of drainage pipe
- Contractors estimated $500/lf for structural shoring to 18ft depth or $25-$35/sf.
- Contractors estimated $350-$450/lf to horizontal directional drill for drainage.
- Recommend consideration of thin-flange decked bulb-tee with cast-in-place deck to save forming.
- Plans show ultrasonic testing (UT) is required for only 10% of welds; recommend this be changed to 100%.
- Recommend consideration of cost for architectural detailing; use bolted instead of welds wherever possible.
- Verify that all steel sections, including stainless steel, are available and meet "Buy America" requirements.
- Reinforcement bar bids may be improved if bid in the winter; high prices reflect iron worker availability.
- Contractors dislike lump sum traffic control.
- Can Contractors get any access through parking lot.
- Does the DOT own or can the DOT get access to parcel adjacent to end span of the bridge?
- Does adjacent Contractor have access to east and west of end span?

Action Item: No further action by the team.

2. Approval of September and October Meeting Minutes

Members reviewed the minutes and provided corrections. On the September minutes, Item 1, Note 3 – change "reasonable" to "reasonably". On the October minutes, members had the following comments:

- Item 10, capitalize Bunyan, Texas, and Bidwell.
- Item 10, add the following bullet to discussion "Does not work on bridges that have approach fills placed after the bridge deck."
- Item 11, add to the discussion bullets "Why is PDA linked to non-fixed leads?"

Action Item: September and October meeting minutes were approved with incorporation of the changes noted above. No further action by the team.

3. Announcement of New Team Member

Mohammad Sheikhizadeh announced that Scott Bernhard, Graham Construction, had joined the team. Welcome Scott!

Action Item: No further action by the team.

4. Lead Team Report

Mo relayed relevant updates from the last lead team meeting. He noted that the group discussed and agreed that WSDOT should take over fabrication inspection on design build contracts. The lead team also discussed the following in relation to the annual meeting scheduled for the 3rd of January:

- Scott Ireland, WSDOT, and Bill Wallace, Kiewit-General, will present Hood Canal Bridge structural work.
- Other presentations include San Francisco Bay Area Fire-damaged bridge replacement, Tacoma Narrows Bridge, and a summary of the Columbia River Crossing project development.
- There will be a summary of upcoming work after the failed vote on the Regional Transportation Investment District (RTID).
- A panel will discuss WSDOT design build contracting and administration.

Action Item: Team members are encouraged to attend the annual meeting 3 Jan 2008.

5. Pile Driving Analyzer (PDA), What Does It Give Us

The team has extensively discussed the necessity for and function of the PDA testing that WSDOT requires for pile driving without fixed-leads. To assist with this discussion, the team invited Bert Minor to present the technical and practical basis for the test. Mike Niemi provided a handout to the group with a summary of the pile driving specifications used by other states. Mo provided the current WSDOT standard specification for pile driving.

Bert relayed the following technical points about Pile Driving Analyzer (PDA) and Case Pile Wave Analysis Program (CAPWAP):

- Short leads may not hang plumb with swinging leads.
- PDA gives you the driving stresses in the pile including compression and top and bottom and tension between.
- PDA is a pile integrity evaluation based on the time for a signal to travel to the bottom of the pile or to an anomaly in the pile steel casing.
- PDA can give the hammer transfer energy.
- CAPWAP gives ultimate soil resistance if done as re-strike after soil around driven pile has had time to set-up time
- PDA sensors are only placed on 2 sides of the pile to monitor for bending; this method will only cover bending in one direction, but Bert believes this is adequate to indicate if there is any problem.
- CAPWAP is valid for low blows per ft
- The majority of this tests on WSDOT projects indicate no problems.

Discussion and included the following:

- Need 2 points of fixity to get the pile plumb.
- The hammer alignment follows the pile.
- A spotter is bottom lead alignment, but not fixity.
- Penetration of the pile 5ft – 10ft into the ground is another point of fixity, with the exact depth a function of the soil stiffness.
- Re-strike frequently requires a bigger hammer than was used for driving, to account for increased soil resistance after set-up.
- The team generally agreed that there is a need for specific expertise for the set-up, testing, and interpretation of PDA and CAPWAP.
- PDA doesn't address pile plumbness.
- Should WSDOT allow mill certification for tensile strength of steel casing for pile driving stress limits, or stick with nominal steel strength?
- New hammers transfer 45% - 60% of their energy to piles, as calculated from PDA.
- Energy losses during driving are typically due to rebound, pad compression and heating, friction on leads, and pile lateral movement.
- For vibrated piles, the proof test could be by drop hammer and Wave Equation Analysis of pile driving (WEAP).
- In Oregon, the DOT has delayed 21 days for PDA results; this has never been a problem for WSDOT which typically responds in 2-3 days.
- WSDOT uses their own WEAP equation that requires good hammer energy transfer.

Discussion about possible changes indicated no agreement within the team. Further, the existing specification, while not perfect for all cases, appeared to well capture the important requirements that WSDOT is looking for to ensure its goals of:

- Requiring the pile be driven plumb, and

- Requiring the casing be undamaged where it will be used as part of the final structure; this is frequently indicated by a minimum casing thickness on the contract plans.

Action Item: The team is requested to thoroughly review the WSDOT specification and provide specific recommendations for change to Mo.

The meeting was adjourned at 12:00. The next set of meetings are scheduled for **25 Jan 08**, **22 Feb 08**, **21 Mar 08**, **18 Apr 08**, **16 May 08**, and **27 Jun 08**.